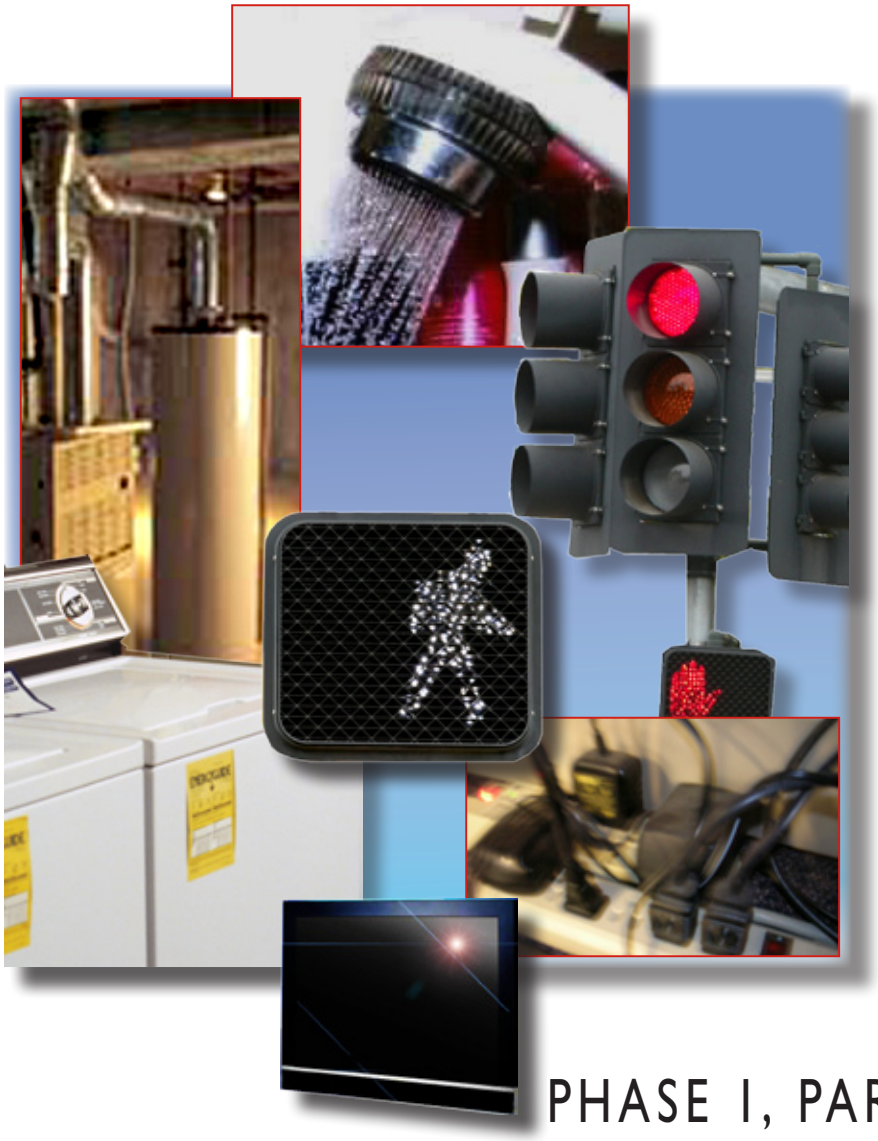
2008 APPLIANCE EFFICIENCY RULEMAKING

CALIFORNIA ENERGY COMMISSION

STAFF REPORT



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Preface

In its April 2, 2008, Scoping Order, the Energy Commission's Efficiency Committee (Committee) established the scope of Phase I of the 2008 Appliance Efficiency Rulemaking regarding possible amendments to the Appliance Efficiency Regulations (Title 20, California Code of Regulations, Section 1601 through Section 1608). Phase I was divided into two separate rulemakings, Part A and Part B. In its April 30, 2008, Notice of Workshop, the Committee added Part C to specifically address possible energy efficiency standards for televisions. This staff report summarizes proposed amendments to the current regulations for the topics being considered in Part B.

Part B includes lighting efficiency standards for metal halide luminaires that can address the indoor commercial and outdoor lighting energy reduction requirements mandated by Assembly Bill 1109 (Huffman, Chapter 534, Statutes of 2007). Part B also includes a voluntary test procedure for battery charger systems (BCS), amendments to the current regulations for residential pool pumps (including requirements for replacement pool pump motors), clarification of the current test method for portable electric spas, and necessary updates and revisions to the overall Appliance Efficiency Regulations for consistency with federal laws. Most of the updates and revisions to the Appliance Efficiency Regulations proposed in Part B of this rulemaking are requirements of federal regulations contained in the Code of Federal Regulations (CFR) (10 CFR 430 [2008], 10 CFR 431 [2008]), and the federal Energy Independence and Security Act of 2007 (EISA), as codified in 42 U.S.C. at Section 6291, et. seq.

Part A includes standards for general purpose lighting and portable lighting fixtures that further address the Committee's priority to carry out the mandates established in AB 1109. AB 1109 requires the Energy Commission to adopt minimum energy efficiency standards for general purpose lighting that, in combination with other programs and activities, reduce average statewide electrical energy consumption by not less than 50 percent from 2007 levels for indoor residential lighting and not less than 25 percent from the 2007 levels for indoor commercial and outdoor lighting by 2018. The Energy Commission is directed to adopt standards by December 31, 2008.

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Abstract

This staff report contains proposed amendments to the Appliance Efficiency Regulations (California Code of Regulations, Title 20, Sections 1601 through 1608) to be considered as part of the 2008 Appliance Efficiency Rulemaking, Phase I, Part B (Docket # 08-AAER-1B).

This report covers lighting efficiency standards for metal halide lighting fixtures, voluntary test procedures for battery charger systems, amendments to the current regulations for residential pool pumps (including requirements for replacement pool pump motors), amendments to the current test method for portable electric spas, and necessary updates and revisions to the overall Appliance Efficiency Regulations for consistency with federal laws.

This report presents staff analysis of the proposed amendments, including legislative criteria, feasibility, cost-effectiveness, energy use, and projected savings on a statewide basis, stakeholder comments, and alternative proposals.

The proposed standards for metal halide lighting fixtures respond to the directives of AB 1109 to reduce indoor commercial and outdoor lighting energy use in California.

Keywords: Appliance Efficiency Regulations, appliance standards, AB 1109, EISA, pool pumps, portable electric spas, metal halide luminaires, high intensity discharge lighting fixtures, battery charging systems, battery chargers

CHAPTER 1: 2008 Appliance Efficiency Rulemaking – Part B, General Intent and Findings

Legislative Criteria

Section 25402 (c)(1) of the Public Resources Code has, since 1975, required the California Energy Commission to adopt standards for the energy efficiency of appliances whose use, as determined by the Energy Commission, requires a significant amount of energy on a statewide basis. New and upgraded standards must be feasible and attainable and must not "result in any added total costs to the consumer over the designed life of the appliance." The added total cost is obtained by comparing the cost and performance of a typical model that the consumer would be expected to purchase with the proposed upgraded or new standard in effect, to the cost and performance of a typical model that the consumer would be expected to purchase without the proposed upgraded or new standard in effect.

The California Lighting Efficiency and Toxics Reductions Act of 2007, enacted by AB 1109 and codified in Public Resources Code section 25402.5.4, requires the Energy Commission to adopt minimum energy efficiency standards for general purpose lighting that, in combination with other programs and activities, reduce average statewide electrical energy consumption by not less than 50 percent from 2007 levels for indoor residential lighting and not less than 25 percent from the 2007 levels for indoor commercial and outdoor lighting by 2018.

Background

Part B of Phase I of the 2008 Appliance Efficiency Rulemaking includes lighting efficiency standards for metal halide (MH) luminaires to address the Committee's priority to carry out the mandates established in AB 1109. Part B also includes consideration of a voluntary test procedure for battery charger systems (BCS), amendments to the current regulations for residential pool pumps (including requirements for replacement pool pump motors), amendments to the current test method for portable electric spas, and necessary updates and revisions to the overall Appliance Efficiency Regulations for consistency with federal laws.

Proposed Regulations

The proposed regulations for Part B consist of the following standards, test procedures, updates and revisions.

1. Metal Halide Luminaires

   Modify the current MH luminaires regulations to increase efficiency, allowing multiple compliance options. The proposed standards are equally technically feasible and will not result in added cost to the consumer over the appliance's design life. The Energy Independence and Security Act (EISA), signed into law in December 2007, established federal standards for MH luminaires that take effect January 1, 2009. EISA specifically

excludes from preemption California's current MH luminaires standards and allows California to adopt revised standards no later than January 1, 2011.

2. Battery Charger Systems (BCS) Test Procedure

   Adopt a BCS test procedure to allow for measurement of active mode energy consumption in BCS. The proposed test method will provide comprehensive and technically sound procedures for obtaining energy performance data to inform the setting of appropriate future standards for BCS.

3. Residential Pool Pumps

   Modify the current residential pool pump regulations to include standards for replacement pool pump motors. The proposed requirements are technically feasible and will not result in added cost to the consumer over the appliance's design life.

4. Portable Electric Spas

   Modify the current portable electric spa test method to clarify and more accurately measure the energy consumption of spas.

5. Updates and Revisions to the Appliance Efficiency Regulations

   Modify the Title 20 regulations to be consistent with the federal efficiency standards and requirements of 10 CFR 430 (2008), 10 CFR 431 (2008), and EISA, as codified in 42 U.S.C., Section 6291, et. seq.

Significant Energy Use on a Statewide Basis

The estimates of statewide energy use for each of the categories of appliances for which regulatory amendments are under consideration are provided in Table 1. Each constitutes a significant amount of energy use on a statewide basis.

Table 1 – Annual Statewide Energy Use by Appliance Type

Category	Statewide Annual Energy Use (millions of kWh)
Metal Halide Luminaires	4,010
Residential Pool Pumps	1,760

Statewide annual energy use for MH luminaires is based on analysis and estimates provided by Pacific Gas and Electric Company (PG&E) with the American Council for an Energy Efficient Economy (ACEEE): *Analysis of Standards Options for High-Intensity Discharge Lighting Fixtures*, April 3, 2008. The estimated annual energy use of 4,010 million kWh is based on the PG&E estimate that the current California stock of MH luminaires is 2.3 million. The annual statewide energy use

is calculated by multiplying the weighted average watt draw per lamp (398 watts) by the average hours of operations per year (4,380 hours) and by the existing stock of MH luminaires (2.3 million).

Statewide annual energy use for residential pool pumps was calculated based on information provided in the *Proposal Information Template for Residential Pool Pump Measure Revisions* prepared by PG&E with the Davis Energy Group (last modified July 23, 2008). The total number of residential pools in California is estimated at 1.1 million, of which 30 percent are outside the scope of the proposed regulation (assumed to operate with pool pumps less than 1 horsepower). Thus, there are an estimated 770,000 pools within the scope of this regulation with an estimated energy use per pool pump of 2,286 kWh/yr. Statewide energy use of 1,760 million kWh is derived by multiplying the energy use per pool pump by the number of pools in California that are within the scope of regulation.

Feasible Alternative Proposals

The only alternative considered to the adoption of the proposed MH luminaires efficiency standards is to not adopt standards. The impact of the alternative (not adopting the new regulations) is to forfeit California's opportunity under EISA to adopt revised standards for this appliance, as well as years of lost energy savings. The proposed regulations do include alternative compliance options.

The only alternative considered to the adoption of the proposed BCS test procedure is to not adopt the test procedure, which is the only comprehensive test procedure developed and proposed for battery chargers in both active and inactive modes. The result of the alternative (not adopting the proposed BCS test procedure) would be to forego the opportunity to collect data necessary to the setting of appropriate future standards for California. Data collection for this appliance is critical for establishing and verifying potential future energy savings.

The alternative to adoption of the proposed amendments to the existing residential pool pump regulations is to not amend the regulations. The proposed changes define the scope of the regulations to capture the originally anticipated energy savings attributable to pool pump motors, including replacement motors. Alternative proposals all represented a step backwards in energy savings for residential pool pumps.

The only alternative considered to amending the current test method for portable electric spas is to not do so. If the proposed revisions to the test method were not adopted our regulations would continue to provide inconsistent results and needlessly burden manufacturers.

Cost-Effectiveness and Projected Statewide Savings

Chapters 2 and 4 of this report contain the information that demonstrates the cost-effectiveness and statewide energy savings associated with the proposed standards for MH luminaires and residential pool pumps, respectively.

CHAPTER 2: Metal Halide Luminaires

Background

In 2004 the Energy Commission adopted efficiency standards for 150-watt to 500-watt metal halide (MH) luminaires that prohibit the use of probe-start lamps and require a minimum ballast efficiency of 88 percent. These standards became effective January 1, 2008. The Energy Independence and Security Act (EISA), signed into law in December 2007, established federal standards for MH luminaires that take effect January 1, 2009. The federal law explicitly excludes current California's MH luminaires standards from preemption and provides the opportunity for the Energy Commission to adopt revised standards no later than January 1, 2011. The federal standards also apply to 150-watt to 500-watt MH luminaires and set minimum pulse-start MH ballast efficiencies.

Unlike California's MH luminaire standard, the federal standard does not prohibit the use of probe-start ballasts. Instead, magnetic probe-start ballasts must meet a stringent requirement of 94 percent ballast efficiency. Electronic probe-start ballasts must meet a minimum efficiency of 92 percent for wattages greater than 250 watts, or 90 percent for wattages less than or equal to 250 watts. A comparison of California's existing standards with the new federal standard and the proposed standards is shown in Table 2.1.

Table 2.1: Existing and Proposed Standards for Metal Halide Luminaires

<table>
<tr><th></th><th colspan="2">Existing California</th><th colspan="3">Federal EISA</th><th colspan="3">Proposed California</th></tr>
<tr><td>Effective Date:</td><td colspan="2">January 1, 2008</td><td colspan="3">January 1, 2009</td><td colspan="3">January 1, 2010</td></tr>
<tr><td rowspan="4">Minimum Ballast Efficiency</td><td rowspan="2">Pulse-Start</td><td rowspan="2">88%</td><td rowspan="2">Pulse-Start</td><td colspan="2" rowspan="2">88%</td><td rowspan="2">Pulse-Start</td><td>> 275 – 500 W</td><td>92%</td></tr>
<tr><td>150 – ≤ 275 W</td><td>90%</td></tr>
<tr><td rowspan="2">Probe-Start</td><td rowspan="2">Not Allowed</td><td>Magnetic Probe-Start</td><td colspan="2">94%</td><td colspan="2" rowspan="2">All Probe-Start</td><td rowspan="2">Not Allowed</td></tr>
<tr><td>Electronic Probe-Start</td><td>> 250 W</td><td>92%</td></tr>
<tr><td></td><td></td><td></td><td>≤ 250 W</td><td>90%</td><td colspan="3">Pulse-Start minimum ballast efficiency of 88% with
1. Integral automatic dimming controls, or
2. Non-conventional wattages as specified (sunsets January 2014)</td></tr>
<tr><td>Alternate Compliance Options</td><td></td><td></td><td></td><td></td><td></td><td colspan="3"></td></tr>
</table>

PG&E with ACEEE submitted *Analysis of Standards Options for High-Intensity Discharge Lighting Fixtures* (last modified April 3, 2008), recommending that the Energy Commission revise the current ballast efficiency requirement for MH fixtures and require ballast efficiencies equivalent to electronic ballasts. Specifically, PG&E recommended a minimum ballast efficiency for pulse-start ballasts of 90 percent for 150-watt to 274-watt fixtures, and 92 percent for 275-watt to 500-watt fixtures be required under California standards. Based on PG&E's analysis, the majority of new fixtures sold are not installed with electronic ballasts and would not obtain the efficiencies required by the proposed regulations. Thus, the proposed standards will save a significant amount of energy by replacing less efficient ballasts with electronic ballasts. The energy savings would help meet the AB 1109 mandates for indoor commercial and outdoor lighting energy reduction.

Adopting PG&E's proposed 90/92 percent standard would provide potential energy savings between 19–59 GWh with corresponding peak demand reduction between 3–11 MW for the first-year of sales, 173–538 GWh annual electric savings and 31–96 MW peak demand reduction after all existing MH luminaires are replaced with new luminaires that meet the new proposed efficiency standards. The PG&E analysis uses 88 percent efficient pulse-start ballasts, consistent with the existing California regulations, to determine current California baseline energy use.

Savings and Cost Analysis

Table 2.2 shows that the proposed requirements for MH luminaires are cost-effective with a simple payback of 3.4 years. The analysis is based upon compliance with ballasts that are 90/92 percent efficient.

The alternate compliance options allowing 88 percent efficiency pulse-start ballasts, in combination with either the use of integral controls or non-conventional wattages, are proposed as alternatives to the minimum ballast efficiency of 90 or 92 percent, and are expected to save at least as much energy as the proposed improvement of the minimum ballast efficiency. The PG&E proposal from April 3, 2008, estimated savings between 2 to 4 percent by requiring ballasts to have a minimum efficiency of 90 to 92 percent (compared to 88 percent required by current California standards). Therefore, the integral controls option will only have to turn the lights off for a minimum of 2 to 4 percent of the time to save an equal amount of energy to the efficient ballast option. It is reasonable to expect that lights will be turned off for significantly more than 4 percent of the time.

Compliance by using non-conventional wattages will save a minimum of 9 to 14 percent over using the conventional 400-, 250-, or 175-watt lamps. This is more than the 2 to 4 percent savings from improving ballast efficiency. Since this option simply reduces the available lamp wattage rather than implying changed or increased technology, it is assumed to have zero additional costs.

Table 2.2 — Energy Savings and Reduced Costs for Metal Halide Luminaires

Annual Sales (units)	Annual Unit Energy Savings (kWh)	First-Year Statewide Energy Savings (GWh)	Incremental Cost of Improvement per unit ($)	Annual Unit Energy Cost Savings* ($)	Simple Payback Period (years)	Design Life (years)	Reduced Total Cost Over the Design Life of the Appliance ($)
254,100	159	40.4	$75.00	$22.26	3.4	9	$200.34

* Energy cost assumed to be $0.14 per kilowatt hour. Composite residential electricity prices used in residential demand forecast, Source: California Energy Demand 2008-2018.

The design life, estimated incremental cost per unit, annual unit energy savings, and annual sales for MH luminaires are based on PG&E's analysis submitted April 3, 2008. Annual unit energy cost savings are calculated by multiplying the average annual reduction in energy use per unit by the energy price. The first-year statewide energy savings were calculated by multiplying the average annual unit energy savings by the total annual unit sales. The reduced total cost over the design life is calculated by multiplying the design life by annual energy cost savings per unit and by energy price. Simple payback period is calculated by dividing the estimated increase in price by the annual energy cost savings.

Stakeholder Comments

The Committee held a public workshop on May 15, 2008, to consider draft regulations. At the workshop the PG&E and ACEEE proposal for 90/92 percent minimum ballast efficiencies was forwarded by staff for consideration as draft regulations. At the workshop and in subsequent written comments, the National Electrical Manufacturers Association (NEMA) proposed an alternate compliance option through the use of integral controls. NEMA also proposed an alternate compliance option through the use of non-conventional wattages. Following the workshop, the Energy Commission staff worked with NEMA, PG&E, and ACEEE to develop alternate compliance options through the use of integral controls and through the use of non-conventional wattage lamps. The NEMA proposed wattage bins for non-conventional wattage lamps in its July 23, 2008, letter have been accepted for use with the proposed standards.

NEMA also recommended exempting all outdoor MH luminaires from Title 20. This recommendation was previously suggested and addressed in the 2006 Appliance Efficiency Rulemaking 1 and dropped from consideration at that time.

NEMA proposed a field-assembled lighting control system compliance option through the use of building efficiency standards (Title 24) in lieu of an appliance regulation. The recently adopted *2008 Building Efficiency Standards* require the use of field-assembled lighting controls depending on the application of the luminaire. Staff was concerned that the NEMA recommendations would effectively nullify existing state and federal MH luminaire regulations by allowing compliance

through a building standards option and by exempting all outdoor MH luminaires from the regulations. It is the purpose of the Appliance Efficiency Regulations to require that all appliances sold in California meet minimum energy requirements, regardless of their application. A building standards approach cannot be used to set an appliance regulation because the application of a luminaire is not known at the time a manufacturer is required to certify the device to the Energy Commission.

NEMA suggested an additional compliance option that it called "part night control." The part night control option was not accepted because it would also require field assembly of auxiliary controls, making it effectively a building standard and not an appliance regulation.

For consistency with federal standards NEMA proposes that regulations specify that the minimum ballast efficiency of 90 percent would apply to 150-watt to 250-watt fixtures, and 92 percent would apply to fixtures of 251watts to 500 watts, and this was included in the final proposed language. NEMA, PG&E, and ACEEE support the final proposed language that applies a sunset date of January 2, 2014, to the option to use non-conventional wattage.

Proposed Regulations

The proposed regulations for MH luminaires require a minimum of 90 percent efficient ballasts for luminaires rated for 150 to 250 watt lamps, and a minimum of 92 percent efficient ballasts for luminaires rated for 251 to 500 watt lamps. The proposal also provides two alternate compliance options that are intended to provide an alternative to the minimum 90/92 percent ballast efficiency. The first option allows the use of ballasts with a minimum efficiency of 88 percent in combination with controls that are integral to the luminaire, either controls integrated directly into the luminaire housing, packaged and sold with a control that is pre-wired, or packaged and sold with a wireless radio controlled sensor. The second option allows the use of ballasts with a minimum efficiency of 88 percent in combination with non-conventional wattage lamps, and is intended to promote the use of lamps that are lower wattage than conventional 400, 250, and 175 watt lamps. The option for using non-conventional wattage lamps would no longer be available starting on January 1, 2014.

1602 Definitions (n) Luminaires.

The following three definitions are proposed for addition to section 1602(n): Integral Control, Occupant Sensor, Lighting, and Automatic Daylight Control. A definition of "Integral Control" is being proposed to precisely describe the meaning and methods of including an integral control with a MH luminaire. "Occupant Sensor, Lighting," and "Automatic Daylight Control," proposed definitions are descriptions of the functionality required for the two control systems that are allowed as alternative compliance methods in section 1605.3(n)(2)(B).

"Integral Control" means an Occupancy Sensor or Automatic Daylight Control that is packaged and shipped with the luminaire, and is integrated into the luminaire at the factory in one of the following three methods:

1. Is integrated directly into the luminaire housing and hardwired to the lighting system; or

2. Is packaged and sold with a control that is pre-wired to allow proper functionality between the control and luminaire, and to allow remote mounting of the control. One end of the wiring shall be pre-wired to the luminaire, and the other end shall be prewired to the control. The wiring may allow temporary disconnection in the field to allow remote mounting of the control; or

3. Is packaged and sold with all required components for a wireless radio controlled sensor that is pre-wired to allow proper functionality between the control and luminaire, and to allow interaction with the wireless control signal in the lighting system.

"Occupant Sensor, Lighting" is a device that automatically reduces lighting or turns lights off soon after an area is vacated.

"Automatic Daylight Control" is a control that automatically reduces lighting in response to available daylight. This control typically uses photosensors to detect changes in daylight illumination and then changes the electric lighting level in response to the daylight changes.

1605.3 (n) Luminaires.

(2) Energy Efficiency Standard for Metal Halide Luminaires

Metal halide luminaires rated for 150 to 500 watts manufactured on or after January 1, 2010 shall not have probe-start ballasts and shall comply with either A or B:

A. Shall have a minimum ballast efficiency as follows:

   1. 90 percent minimum ballast efficiency for 150 to 250 watt lamps

   2. 92 percent minimum ballast efficiency for 251 to 500 watt lamps

B. Shall have a minimum ballast efficiency of 88 percent and shall comply with either 1, 2, or 3:

   1. Shall have an Occupant Sensor which is an Integral Control as defined in §1602(n), shipped with the factory default setting to automatically reduce lamp power through dimming by a minimum of 40 percent within 30 minutes or less after the area has been vacated.

   2. Shall have an Automatic Daylight Control which is an Integral Control as defined in §1602(n), shipped with the factory default setting to automatically reduce lamp power through dimming by a minimum of 40 percent. This compliance option shall only be used for metal halide luminaires rated for only indoor use.

   3. Shall be manufactured between January 1, 2010 and December 31, 2013 and shall be equipped with a ballast able to operate only 150-160 watt, 185-225 watt, or 280-350 watt

lamps. This compliance option shall not be available for luminaires manufactured on or after January 1, 2014.

Exceptions to Section 1605.3(n)(2)(A and B):

The following metal halide lighting systems shall not have probe-start ballasts and are not required to meet the minimum ballast efficiency requirements:

1) Luminaires that use regulated lag ballasts;

2) Luminaires that use electronic ballasts which operate at 480 volts; or

3) Luminaires that meet all three of the following requirements:

   a. Are rated for use only with 150 watt lamps, and

   b. Are rated for use in wet locations, as specified by the National Electrical Code 2002, Section 410.4(A); and

   c. Contain a ballast that is rated to operate at ambient air temperatures above 50 degrees C, as specified by UL 1029-2001.

Section 1606. Filing by Manufacturers; Listing of Appliances in Database

Section 1606(a) – Table V Data Submittal Requirements has been revised to specify the required information.

Table V (N)

N	Metal Halide Luminaires	Compliance Method Used	1. ≥ 90/92% efficient ballast 2. ≥ 88% efficient ballast with integral control 3. ≥ 88% efficient ballast able to operate only 150-160 watt, 185-225 watt, or 280-350 watt lamps
		Lamp Position	Vertical Base-Up, vertical base-down, horizontal, universal, other
		Lamp Rating (watts)	
		Ballast Type {only applies to models manufactured on or after January 1, 2006}	Probe-start electronic, probe-start magnetic, pulse-start electronic, pulse start magnetic, other (specify)
		Minimum ballast efficiency	Percentage
		Rated Use	Indoor, outdoor, both
		Integral Control Type	Occupancy sensor, automatic daylight control, not applicable
		Integral Control Method	1. Directly into luminaire housing 2. Packaged and sold pre-wired 3. Integrated wireless radio controlled sensor 4. Not applicable
		Integral Occupancy Sensor will be shipped with the factory default setting to automatically reduce lamp power through dimming by a minimum of 40 percent within 30 minutes or less after the area has been vacated.	Yes, no, not applicable
		Integral Automatic Daylight Control will be shipped with the factory default setting to automatically reduce lamp power through dimming by a minimum of 40 percent.	Yes, no, not applicable

Source: California Energy Commission, *2007 Appliance Efficiency Regulations*, August 2007

CHAPTER 3: Battery Charger Systems Test Method

Background

Battery chargers coupled with their batteries are referred to as battery charger systems (BCS). BCS are used in a wide range of products and differ in size and battery chemistry. Four battery chemistries currently dominate the market: nickel-cadmium (NiCd), nickel-metal hydride (NiMH), lithium-ion (Li-Ion), and sealed lead acid. PG&E's study estimates that there are more than 130 million BCS in California and concludes BCS efficiency could be improved dramatically, which would yield significant energy savings.

California's Appliance Efficiency Regulations do not currently include test procedures or efficiency standards for battery charger systems. To improve the efficiency of BCS through Title 20, a comprehensive test procedure must be adopted that identifies energy consumption in both active (charge) and inactive modes. Different organizations have developed slightly different procedures for defining and measuring efficiency in battery chargers.

In its April 2, 2008, Scoping Notice, the Committee noted the Energy Commission's participation in the development of a test method for battery charging systems through the Public Interest Energy Research (PIER) Program. Ecos Consulting (Ecos) and the Electric Power Research Institute (EPRI), funded by PIER and PG&E, developed a separate and more comprehensive test procedure for all types of residential and commercial battery charger systems, including measurement of energy consumption by BCS in active, maintenance, and no-battery mode. Ecos with PG&E completed this comprehensive test method for California in late 2007, after four years of research, drafting, stakeholder meetings, and public comments. PG&E submitted a *Proposal Information Template for Battery Charger Systems* on January 30, 2008, recommending adoption of the *Energy Efficient Battery Charger System Test Procedure* developed by Ecos on behalf of PIER and PG&E.

The Committee's Scoping Notice also pointed out federal activities related to test methods for battery chargers. The current U.S. Environmental Protection Agency (EPA) test method, which applies only to battery chargers used with power tools, lawn care products, hygiene products, and kitchen tools, measures only standby and maintenance energy use. The U.S. Department of Energy (DOE) has adopted a Uniform Test Method for Measuring the Energy Consumption of Battery Chargers beginning December 8, 2006. DOE's test procedure does not measure energy consumed by BCS in active charge mode. DOE has stated its intent to consider adding charging energy use to the test procedure at a future date.

PG&E/Ecos Consulting Proposal

The first versions of the PG&E/Ecos proposed test procedure (Versions 1.0-1.3) were designed to measure BCS of less than 2 kW of power with batteries of less than 50 kWh capacity. The limit of the method was imposed as Ecos had not been able to test a sufficient number of large battery systems to prove the test method was valid for large battery systems. To expand the scope to include large BCS, Ecos contacted Southern California Edison (SCE) about its experience with such

systems. *Energy Efficiency Battery Charger System Test Procedure,* Version 2.0 was created to merge the previous Ecos test method with test methods developed by SCE to create a procedure capable of testing larger "motive" BCS, including electric vehicles such as golf carts and industrial-type battery chargers.

The initial Version 2.0 went through several revisions to incorporate changes suggested by SCE, the Energy Commission, and stakeholders such as the Association of Home Appliance Manufacturers (AHAM), and Power Tools Institute (PTI). The resulting test procedure, *Energy Efficiency Battery Charger System Test Procedure,* Version 2.1.4, August 1, 2008, was finalized and presented to the Energy Commission. It is this final version that Energy Commission staff recommends for adoption.

The PG&E/Ecos proposal also recommended the Energy Commission issue a call for test data from manufacturers or other interested parties to help in collecting BCS test data. Staff agrees that this additional data will be critical in analyzing how BCS use energy, how energy use relates to battery chemistries/capacity, and what role technologies and product types play in energy consumption. Comprehensive test data will be helpful in forming the basis to develop appropriate future standards for BCS.

Federal Activity

DOE has been mandated by EISA to develop a test procedure and, if feasible, a standard for BCS by July 2011. Currently, 10 CFR Part 430 contains a test procedure for "Inactive Mode Energy Consumption" and a placeholder for "Active Mode Energy Consumption." In meeting with Energy Commission staff and BCS stakeholders in April 2008, DOE indicated that it is considering including an active mode BCS test procedure in its upcoming 2009 rulemaking. All parties agree that harmonization of federal and state regulations for BCS is most efficient and desirable.

Stakeholder Input

The Energy Commission staff has engaged a wide-ranging group of stakeholders to identify the refinements needed to finalize the proposed BCS test procedure for California as part of Phase I, Part B of the 2008 Appliance Efficiency Rulemaking. Following the January 15, 2008, Committee scoping workshop, staff facilitated meetings with BCS stakeholders on April 8, 2008, April 17, 2008, and May 8, 2008, to receive input and comments on the Ecos test procedure. AHAM and PTI have participated throughout the stakeholder process, requesting specific clarifying and substantive changes to the Ecos test procedure language in comments submitted on April 18, 2008. PG&E and Ecos have responded to comments received and made selected revisions to the test procedure in subsequent versions.

On May 28, 2008, staff conducted a large BCS stakeholders meeting to discuss potential testing of large BCS, at which all stakeholders agreed to the addition of a large BCS test procedure. The large BCS test procedure is included in a separate section (Part B) of the proposed Ecos test procedure. Comments and suggestions received from stakeholders have been incorporated into the test procedure. The updated test procedure, *Energy Efficiency Battery Charger System Test Procedure,*

Version 2.1.4, August 1, 2008, which includes both the original content and large BCS, is final and available from Ecos Consulting.

The Energy Commission received comments from the Consumer Electronics Association (CEA) and Motorola related to federal external power supply (EPS) regulations and their overlap with the adoption of BCS test procedures and regulations. Regarding possible federal preemption, CEA notes in its letter sent to the Energy Commission on March 14, 2008, that "Preemption of state activity relative to Class A EPS's arguably is in effect now (and certainly no later than July 1, 2008), and any preexisting, pending or future standards are inapplicable with respect to class A EPSs."

U.S.C.42 Section 6295(u)(7) states as follows:

> "END-USE PRODUCTS. An energy conservation standard for external power supplies shall not constitute an energy conservation standard for the separate end-use product to which the external power supplies is connected."

It is clear from federal appliance law that all end-use products that have separate EPS are excluded from EPS energy efficiency standards. Many separate end-use consumer products, such as cell phones, personal digital assistants, digital audio players, cordless telephones, camcorders, computer monitors, and laptops, etc., connect to an EPS because they have built-in battery chargers for charging their batteries. The battery charger systems that are built into separate end-use products are not considered EPS; therefore, their testing for energy efficiency standards does not contribute to double testing. Moreover, these concerns are addressed by the fact that there are no provisions in the proposed test procedure to test an EPS or internal power supply.

Emergency Lighting Systems and National Electrical Manufacturers Association (NEMA) have proposed to exclude emergency lighting systems (ELS) from the BCS test procedure. The exclusion of ELS is not directly related to the test procedure; therefore, staff recommends no changes to the Ecos test procedure.

Proposed Regulations

Staff proposes the adoption of the *Energy Efficiency Battery Charger System Test Procedure,* Version 2.1.4, August 1, 2008, as submitted by PG&E/Ecos. All additions to the regulations for BCS are intended for inclusion of the test procedure and necessary supporting definitions.

Section 1601(u) -- Scope: Add battery charger systems.

Section 1602(u) – Definitions: Add definitions from *Energy Efficiency Battery Charger System Test Procedure*, Version 2.1.4 August 1, 2008.

Section 1604(u) –Test Procedure for Specific Appliances: Insert *Energy Efficiency Battery Charger System Test Procedure Version*, 2.1.4 August 1, 2008 with appropriate contact information and links at the end of this section.

CHAPTER 4: Residential Pool Pumps and Portable Electric Spas (Test Method Clarification)

Background

Residential Pool Pumps

The California Energy Commission adopted standards for residential pool pumps in 2004 that became effective January 1, 2006. The pool pump standards regulated pool pump motor types and required testing and listing of pool pump motor combinations. Beginning in 2008, pool pump standards required use of multi-speed motors and controls for pool pumps of greater than 1 horse power (HP). However, the 2005 standards were drafted in such a way that the requirements applied only to new residential pool pumps and not to replacement residential pool pump motors installed in existing residential pool pumps. Pool pump motors are not explicitly identified in the scope of the standards. The intent of the standards was to include both the pool pump and replacement pool pump motors. At the time the standards were originally proposed and adopted, the anticipated energy savings included replacing residential pool pump motors installed in existing residential pool pumps. Language changes amending the Appliance Efficiency Regulations will add the residential pool pump motor replacement requirements.

PG&E submitted an initial *Proposal Information Template for Pool and Spa Measure Revisions* in January 2008, followed by modified versions dated May 23, 2008, and July 23, 2008.

PG&E recommended that the scope of residential pool pumps be amended to explicitly include the pool pump, pump motor, and replacement motors. PG&E estimates that there are approximately 1.1 million private, residential, inground swimming pools in California with annual pool pump sales of 34,000. In addition to the sale of new pool pump and motor combinations, approximately 113,100 pool pump motors are replaced each year. The PG&E study estimates that in 20 percent of these cases the whole pump will be replaced and will be covered by the current standard. An additional 30 percent of total pool pump motors will be replaced with a less than 1 HP motor and will be allowed by the standard to remain single-speed. The remaining 50 percent will be a motor replacement with a capacity greater than 1 HP, which will be required by the proposed standards to be two-speed. The energy savings associated with replacing an average single-speed pool pump motor with a two-speed motor is estimated to be 881 kWh/yr. The proposed amendments to the existing regulations would result in estimated statewide energy savings of 497 GWh and a 132 MW peak demand reduction over the first 10 years.

Related to the test method for residential pool pumps, PG&E suggested adding the requirement for testing and certifying data for "Curve C," which represents the system curve of a well-designed pool pump that has a low-pressure drop. Testing and reporting "Curve C" data also will facilitate compliance with the residential pool installation requirements in Section 150(p)1B of the 2008 Building Efficiency Standards (Title 24, Part 6), adopted on April 23, 2008.

Portable Electric Spas

There has been a long-standing complication with the portable electric spa test method that parties have sought to correct. The current regulations specify the minimum water temperature and maximum ambient air temperature, without specifying either the maximum water temperature or minimum ambient air temperature. The current regulations also neglect to specify the level to which the spa should be filled. The proposed changes to the test method include two-sided temperature tolerances and a definition of spa volume to correct these problems.

Additionally, PG&E has proposed removing the spa insulation R-value, and the R-value of the spa cover from the reporting requirements. PG&E states that the standby watts value (already tested and reported) provides the best indication of actual efficiency performance, while the two R-value figures can result in consumer confusion regarding which spas are actually the most efficient.

Savings and Cost Analysis

For residential pool pumps, the feasibility and cost-effectiveness of the regulations was demonstrated in the 2004 rulemaking that led to the adoption of the initial language. However regulations as adopted during that rulemaking inadvertently did not include replacement pool pump motors. The changes proposed accomplish the original intent of the 2004 rulemaking and define the scope of the regulations to capture the originally anticipated energy savings. The cost and savings analysis below is based upon 2008 data and shows the proposed regulations are cost-effective for both replacement motors and pool pump and motor combinations.

For residential pool pumps the expected energy and cost savings are shown in Table 4.

Table 4—Energy Savings and Reduced Costs for Residential Pool Pumps

Annual Sales (units)	Annual Unit Energy Savings (kWh)	First-Year Statewide Energy Savings (GWh)	Incremental Cost of Improvement per unit ($)	Annual Unit Energy Cost Savings* ($)	Simple Payback Period (years)	Design Life (years)	Reduced Total Cost Over the Design Life of the Appliance ($)
113,100	881	99.6	$420.00	$123.34	3.4	10	$1,223

* Energy cost assumed to be $0.14 per kilowatt hour. Composite residential electricity prices used in residential demand forecast, Source: California Energy Demand 2008-2018

The design life, estimated incremental cost per unit, annual unit energy savings, and annual sales for pool pumps, pool pump motors and pool pump motor combinations are based on PG&E's *Proposal Information Template for Residential Pool Pump Measure Revisions*, May 23, 2008. Annual unit energy cost savings are calculated by multiplying the average annual reduction in energy use per unit with energy price. The first-year statewide energy savings were calculated by multiplying the

average annual unit energy savings by the total of unit sales. The reduced total cost over the design life is calculated by multiplying the design life by annual energy cost savings per unit and by energy price. Simple payback period is calculated by dividing estimated increase in price by annual energy cost savings.

For portable electric spas, the proposed language is accepted by most of the spa manufacturers and the Association of Pool and Spa Professionals (APSP). These proposed changes are providing clarification to definitions, test method, and data collection, and are not imposing any novel requirements or new costs.

Stakeholder Input

At the May 15, 2008, Committee public workshop PG&E, APSP, Independent Pool and Spa Service Association (IPSSA) members, and other pool industry representatives participated and later submitted written comments. IPSSA expressed concerns related to the replacement pool pump motor requirements for two-speed pool pump motors. PG&E addressed most of these concerns in written comments.

IPSSA pointed out the confusion that pool pumps do not have a service factor and that total HP applied to pool pumps is not valid. PG&E explained that although pool pumps do not have service factors, the pool pump motors do have them. The product of nameplate HP and service factor is the total HP (capacity) of the pool pump motor.

IPPSA pointed out that two-speed motor controllers increase the cost to customers and asked that the language related to two-speed controllers be removed. PG&E pointed out that two-speed motor controllers are required to operate two-speed motors, and that the added cost was included in the savings and cost analysis.

IPSSA observed that many swimming pool owners have older pools that will not perform well on two-speed pumps. PG&E studies indicated that most older pools have smaller pumps and many of these would be exempted as pumps less than 1 HP are not required to be two-speed, and requested data showing where two-speed pump will not work. IPSSA also commented that proposed regulations could lead to rebuilding of non-efficient old motors rather than installation of a new controller and two-speed motor. PG&E's response is that this is not economically practical for smaller motors and is unlikely to happen.

Staff conducted a meeting with IPSSA members on June 26, 2008, to discuss issues related to pool pump, pool pump replacement motors, and pool pump and motor combinations. Staff explained the purpose of the current rulemaking to include pool pump replacement motors in the scope, to clarify current regulations, and to define terms used in the regulations as appropriate. IPPSA requested that 1.25 HP capacity motors be excluded from the scope of the proposed regulations. Staff has concluded that this would result in a significant reduction in potential statewide energy savings for the proposed regulations and would also result in a reduction in the existing efficiency standards for pool pump and motor combinations. Staff has concluded that 1 HP or greater capacity replacement motors as defined within the scope of proposed regulation is economically

justified to provide significant reduction in statewide energy use. IPSSA's proposal to change the scope to 1.25 HP would result in less statewide energy savings.

IPSSA also expressed concerns regarding older and sand-filtered pools common in California. Their concern was that the low speed of a two-speed motor would not be able to properly filter these pools. Therefore, the owner of the pool would be required to run the pool pump at high speed settings during operation. Thus, the energy savings for the two-speed motor would be forfeited. This makes the incremental cost of replacing a single-speed motor with a two-speed motor uneconomical. Staff has requested, but has not received, any data supporting IPSSA's concern. Therefore, there is no basis from which to exclude pool pump and motor combinations as well as replacement pool pump motors used with sand-filtered pools.

During discussion with IPSSA, staff was informed that replacement motors for sand-filtered pools are commonly made with ½ to ¾ HP single-speed motors. With widely available single-speed motors of this size range replacement motors for sand-filtered pools should not be affected by the proposed regulations.

Proposed Regulations

Staff proposes the following amendments to the Appliance Efficiency Regulations for residential pool pumps and portable electric spas as indicated in underline and strikeout.

1601(g) – Scope.

Gas pool heaters, oil pool heaters, electric resistance pool heaters, heat pump pool heaters, residential pool pump and motor combinations, replacement residential pool pump motors, and portable electric spas.

1602(g) – Definitions.

(a) General.

"HP" means horsepower.

(b) Pool Heaters, Portable Electric Spas, Residential Pool Pumps and Motor Combinations, and Replacement Residential Pool Pump Motors~~Portable Electric Spas~~.

"Capacitor start-capacitor run" means a capacitor start single phase motor that has a capacitor in series with the starting winding.

"Capacitor start-induction run" means a motor that uses a capacitor via the starting winding to start an induction motor, where the capacitor is switched out by a centrifugal switch once the motor is up to speed.

"Default speed" means the low speed, having a rotation rate that is no more than one-half of the motor's maximum rotation rate.

"Electronically commutated motor (ECM)" means a brushless DC motor that utilizes a permanent magnet rotor and built in inverters.

"Nameplate HP" means the HP displayed on the nameplate mounted on the motor.

"Permanent Split Capacitor (PSC)" means a two-phase motor operated from a single-phase voltage source with a capacitor connected in series with either one of the two windings.

"Pool Pump Motor Capacity" means a value equal to the product of motor's nameplate HP and service factor.

"Replacement residential pool pump motor" means a replacement motor intended to be coupled to an existing pump that is used to circulate and filter pool water in order to maintain clarity and sanitation.

"Residential pool pump" means an impeller attached to a ~~pump~~motor that is used to circulate and filter pool water in order to maintain clarity and sanitation.

"Residential pool pump and motor combination" means a motor coupled to a pump that is intended for either a new filtering system or as a replacement for an existing filtering system and that is used to circulate and filter pool water in order to maintain clarity and sanitation.

"Residential pool pump motor" means a motor attached to an impeller that is used to circulate and filter pool water in order to maintain clarity and sanitation.

"Spa volume" means the actual fill volume of the spa, under normal use, in gallons.

"Speed" means the number of revolutions of the motor shaft in a given unit of time. Speed is expressed in revolutions per minute (RPM).

"Split Phase Start" means a motor that employs a main winding with a starting winding to start the motor. After the motor has attained approximately 75 percent of rated speed, the starting winding is automatically disconnected by means of a centrifugal switch or by a relay.

"Two speed motor" means a motor designed or intended to be operated at one of two preset speeds.

"Variable speed motor" means a motor whose speed can vary continuously over a specified range.

1604(g) – Test Methods.

(f) Pool Heaters, Portable Electric Spas, ~~and~~ Residential Pool Pump and Motor Combinations, and Replacement Residential Pool Pump Motors.

(1) Test Method for Portable Electric Spas

…

(B) The water temperature shall ~~remain at or above the test temperature of~~be 102°F, ± 2°F for the duration of the test.

(C) The ambient air temperature shall ~~remain at or below the test temperature of~~ be 60°F, ± 3°F for the duration of the test.

…

(F) Record the total energy use for the period of test, starting at the end of the first heating cycle after the ~~four hour~~ stabilization period specified in Section 1604(g)(2)(E), and finishing at the end of the first heating cycle after 72 hours has elapsed.

…

(H) Data reported shall include: spa identification (make, model, S/N, specifications); volume of the unit in gallons; ~~cover R-value;~~ supply voltage; average relative humidity during test; minimum, maximum, and average water temperatures during test; minimum, maximum, and average ambient air temperatures during test; date of test; length of test (t, in hours); total energy use during the test (P, in Wh); and standby power (P/t, in watts).

(3) Test Method for Residential Pool Pumps

The test method for residential pool pumps is as follows:

(A) IEEE 114-2001 shall be used for the measurement of motor efficiency.

(B) ANSI/HI 1.6-2000 shall be used for the measurement of pump ~~and motor combinations~~ efficiency.

(C) ~~Two~~Three curves shall be calculated:

Curve A: $H = 0.0167 \times F^2$
Curve B: $H = 0.050 \times F^2$
Curve C: $H = 0.0082 \times F^2$
Where:

H is the total system head in feet of water.
F is the flow rate in gallons per minute (gpm).

(D) For each curve (A~~&~~, B, or C), the pump head shall be adjusted until the flow and head lie on the curve. The following shall be reported for each curve at the default speed of the~~and~~ pump ~~speed (two-speed pumps shall be tested at both high and low speeds)~~:

~~1. Head (feet of water)~~
1~~2~~. Flow (gallons per minute)
2~~3~~. Power (watts and volt amps)
3~~4~~. Energy Factor (gallons per watt hour)
Where the Energy Factor (EF) is calculated as:
EF = Flow (gpm) * 60 / Power (watts)

1605.3(g) – Efficiency and Design Standards.

(1) **Residential Pool Pump and Motor Combinations, and Replacement Residential Pool Pump Motors.**

(A) **Motor Efficiency.** Pool pump motors manufactured on or after January 1, 2006 may not be split-phase or capacitor start – induction run type.

(B) **Two-Speed Capability.**

~~(i)~~1. **Residential Pool Pump and Motor Combinations.** Pool pump motors with a pool pump motor capacity of 1 HP or more, which are manufactured on or after January 1, 2008, shall have the capability of operating at two or more speeds with a low speed having a rotation rate that is no more than one-half of the motor's maximum rotation rate. The pump motor must be operated with a pump control that shall have the capability of operating the pump at least at two speeds.

2. Pool pump motors with a pool pump motor capacity of 1 HP or greater which are manufactured on or after January 1, 2010, and installed in existing residential pool pumps as replacement residential pool pump motors, shall have the capability of operating at two or more speeds with a low speed having a rotation rate that is no more than one-half of the motor's maximum rotation rate. The pump motor must be operated with a pump control that shall have the capability of operating the pump at least at two speeds.

~~(ii)~~3. **Pump Controls.** Pool pump motor controls manufactured on or after January 1, 2008 that are sold for use with a two- or more speed pump

shall have the capability of operating the pool pump at least at two speeds. The control's default circulation speed setting shall be ~~the lowest speed~~ no more than one-half of the motor's maximum rotation rate.~~, with a~~ Any high speed override capability shall be~~ing~~ for a temporary period not to exceed one ~~normal~~ 24-hour cycle without resetting to default settings.

1606. Filing by Manufacturers; Listing of Appliances in Database.

Table V, subsection G - Data Submittal Requirements.

	Appliance	Required Information	Permissible Answers
G	Residential Pool Pump and Motor Combinations and Replacement Residential Pool Pump Motors	Motor Construction	PSC, Capacitor Start-Capacitor Run, ECM, Capacitor Start-induction run, split-phase
		Motor Design	Single-speed, dual-speed, multiple-speed, variable-speed
		Frame	
		Speed (in rpm)	
		Motor has Capability of Operating at Two or More Speeds with the Low Speed having a Rotation Rate that is No More than One-Half of the Motor's Maximum Rotation Rate	Yes, no
		Unit Type	Residential Pool Pump and Motor Combination, Replacement Residential Pool Pump Motor
		Pool Pump Motor Capacity	
		~~Pool Pump~~ Motor Service Factor	
		Motor Efficiency (%)	
		~~Rated~~Nameplate Horsepower	
		Flow for Curve 'A' (in gpm)	
		Power for Curve 'A' (in watts)	
		Energy Factor for Curve 'A' (in gallons per watt-hour)	
		Flow for Curve 'B' (in gpm)	
		Power for Curve 'B' (in watts)	
		Energy Factor for Curve 'B' (in gallons per watt-hour)	
		Flow for Curve 'C' (in gpm)	
		Power for Curve 'C' (in watts)	

		Energy Factor for Curve 'C' (in gallons per watt-hour)	
	Portable Electric Spas	*Voltage	
		Volume (gallons)	
		Rated Capacity (number of people)	
		~~Insulation R-value of Spa Cover Provided with the Spa~~	
		Standby Power (watts)	
		Spa Enclosure is Fully Insulated	Yes, no
		~~If Spa is Fully Insulated, R-value of Insulation~~	

Source: California Energy Commission, 2007 Appliance Efficiency Regulations, August 2007

1607(g) – Marking Requirements.

(10) **Residential Pool Pumps.**

(~~i~~A) Each residential pool pump shall be marked, permanently and legibly on an accessible and conspicuous place on the unit, in characters no less than ¼", the rated horsepower of the pump.

(~~ii~~B) Each residential pool pump motor shall be marked, permanently and legibly on an accessible and conspicuous place on the unit, in characters no less than ¼", the ~~total horsepower~~pool pump motor capacity of the motor.

(C) Two speed or multi-speed residential pool pumps, certified under Section 1606 of this Article on or after January 1, 2010, shall be marked, permanently and legibly on an accessible and conspicuous place on the unit, in characters no less than ¼", This pump must be installed with a two speed or multi-speed pump motor controller.

CHAPTER 5: Updates and Revisions Necessary for Consistency With Federal Law and Other Non-Substantive Changes

Background

The Energy Commission's Appliance Efficiency Regulations (Regulations) include standards, definitions, test methods, and other requirements for federally regulated appliances. Since California's Regulations last underwent a major update in 2005, federal standards, definitions, test methods, and other requirements have been added or changed and incorporated into federal law in 10 CFR 430, 10 CFR 431, and 16 CFR 305. These changes include those established in EISA, as codified in 42 U.S.C., Section 6291, et. seq. To maintain consistency with federal standards and regulations, a thorough review of updated federal standards and regulations was necessary. Since these changes are already federal law, or will be on a specific date in the near future, corrections to California regulations to establish consistency with the federal law are already law and, therefore, these changes have no regulatory effect. These changes in the proposed regulations (Express Terms) are reflected with either ~~strikeout~~ or underlined text. Additionally, other changes without regulatory effect are also included. These are changes to the structure and sequencing of some sections that are proposed to make the regulations internally consistent and correct, using the standard formatting of the Appliance Efficiency Regulations.

With few exceptions the majority of the changes proposed for this category are the result of a thorough review of 10 CFR 430 (2008), 10 CFR 431 (2008), and EISA. The remaining changes are incorporated to make the Regulations internally consistent and correct. There has been, to date, minimal stakeholder input on these proposed changes. Staff welcomes stakeholders' review of these changes to ensure their accuracy and completeness.

Changes to Table X (data reporting requirements, formerly found at Table V) are necessary to conform the data collection requirements to include data for the federally regulated appliances newly added to the Express Terms. See Table X for the following federally regulated appliances:

- Subsection (d): Ceiling fan light kits;
- Subsection (d): Dehumidifiers;
- Subsection (k): Medium-base compact fluorescent lamps;
- Subsection (k): General service incandescent lamps;
- Subsection (k): Candelabra base and intermediate base incandescent lamps;
- Subsection (t): Distribution transformers.

Proposed Regulations

The following types of changes in the proposed regulations represent non-substantive changes without regulatory effect:

- Updates of federal regulations affecting federally regulated appliances.
- Updates of federal regulations affecting previously California-only regulated appliances.
- Renumbering of tables or sections to maintain internal consistency within the Regulations.
- Retitling of Section headers to maintain internal consistency within the Regulations.
- Wording or formatting to maintain internal consistency within the Regulations.
- Company name, address, website, phone number, and/or FAX number to reflect current contact information.
- Moving definitions from one section to another to maintain consistency within the Regulations.
- Updating and/or deleting of test methods or test standards to incorporate changes made since these Regulations were last updated.
- Moving of all sections related to "Consumer Audio and Video Equipment" from being included in same section as External Power Supplies into its own section throughout the regulations for purposes of clarity.

Changes are made throughout "Table X" – "Data Submittal Requirements" to update data requirements either to conform with updated federal requirements, updated test methods, or to correct errors.

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Chapter 5

10 CFR 430 (2008).

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